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Committee on the Peaceful Uses of Outer Space

402nd Meeting
Tuesday, 14 June 1994, 10 a.m.
Vienna

Chairman: Mr. Hohenfellner . . . . . (Austria)

The meeting was called to order at 10.10 a.m.

Report of the Legal Subcommittee on the work of its thirty-third session (A/AC.105/573) *(continued)*

Mr. Pedsci-Bourel (Argentina) *(interpretation from Spanish)*: I wish first of all to express my delegation's appreciation for the work carried out by the Chairman of the Legal Subcommittee, Mr. Vaclav Mikulka of the Czech Republic. At the last session he once again demonstrated his talents as a jurist and as a leader in guiding the work of the Legal Subcommittee.

My delegation would like to refer briefly and specifically to the tasks undertaken by the Subcommittee.

With regard to the question of the principles relevant to the use of nuclear power sources in outer space, we believe that the decision provisionally to suspend the consideration of this subject at the next session was wise since it does not prevent the Working Group from being convened if, in the Legal Subcommittee's opinion, substantive progress is made on this subject at the 1995 session of the Scientific and Technical Subcommittee. At the same time, this decision does not prejudice the positions of various delegations with respect to the duration of the Subcommittee's sessions.

In my delegation's opinion, no satisfactory progress was made on the subject of the definition and delimitation of outer space and the utilization of the geostationary orbit, although there was some forward movement.

On the sub-item "The definition and delimitation of outer space", my delegation is confident that the commitment to continue discussion on the draft questionnaire at the next session will enable us to make some progress towards achieving a reasonable consensus on the reference questionnaire. In this connection, we urge delegations with particular interests in this matter to make the necessary efforts to help us, in some way, to unblock the current situation.

With regard to the sub-item "The geostationary orbit", my delegation believes that the debate which took place on document A/AC.105/C.2/L.192 was reasonable and will make it possible to continue discussion of this item at the next session.

My delegation, as a sponsor of document A/AC.105/C.2/L.182/Rev.1, on the legal aspects related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interests of all States, taking into particular account the needs of the developing countries, welcomed the interesting exchange of views that took place during the 1994 session of the Legal Subcommittee. On the basis of the constructive and specific criticisms we received, we shall have to reformulate some principles and take account of certain elements not originally included in the document. My delegation would like formally, in this plenary meeting of the Committee, to express its commitment to this task. Furthermore, we wish to emphasize, as a conclusion of the debate which took place, that we believe that there are good foundations for continued work on this matter, to which we attach great importance.

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The Argentine delegation welcomes and supports the Brazilian proposal to hold a seminar on the subject of space debris, on the understanding that this will not prejudice any of the tasks carried out by the Scientific and Technical Subcommittee on this matter. We believe that a seminar can be an appropriate forum for an exchange of views on a subject which is important and clearly topical. We trust that at the next session of the Legal Subcommittee it can actually be decided to convene such a seminar.

Before concluding my statement, I should like to emphasize that my delegation attaches fundamental importance to the Legal Subcommittee's devoting part of its energies to re-examining what subjects should be discussed, the priorities that should be assigned, the additional subjects that deserve its attention, its methods of work and so on, given that any institution or collegiate body is reinvigorated by a process of self-analysis or self-explanation if it is carried out seriously and decisively.

Finally, the Argentine delegation reiterates its commitment to work constructively on the tasks of the Legal Subcommittee so that it can regain the role of a vanguard and creative body which it had for many decades in the fundamental task of bringing about consensus on various positions, and thus proceed to the codification and progressive development of the principles of outer space law.

Mr. Hodgkins (United States of America): My delegation would like to offer some general comments concerning agenda item 6, "Report of the Legal Subcommittee".

First, I should like to express my delegation's satisfaction with the superb work done by the Subcommittee's Chairman, Mr. Vaclav Mikulka of the Czech Republic.

I think that at this point in our deliberations I will forgo reiterating my delegation's views on the substantive issues being taken up by the Legal Subcommittee. Those views are well known and were fully discussed at the Subcommittee's last session. Instead, we want to comment briefly on the future of the Subcommittee's work.

We were pleased with the results of last week's informal meeting on the organization of work of the Legal Subcommittee; indeed, my delegation and others have called for such a discussion for many years in this Committee, and the meeting on Friday was a significant step forward. We were particularly encouraged by the cooperative spirit that characterized the debate, but it was also clear that we are going to face many difficult questions that will require compromise on the part of all delegations. How the Subcommittee organizes its work and uses the available conference resources is crucial to making it an effective deliberative body in the United Nations system.

As we look to the future, it is important to remember the role that the Subcommittee plays in promoting international space cooperation. In establishing the Committee on the Peaceful Uses of Outer Space (COPUOS) over 30 years ago, the General Assembly mandated COPUOS to study the nature of legal problems which may arise from the exploration of outer space. With this in mind, my delegation firmly believes that matters considered by the Legal Subcommittee should not unnecessarily impede further progress in the exploration and use of outer space.

From the legal standpoint, space activities provide complicated, and even unique, challenges, so we must take a considered and systematic approach to dealing with the future work of the Subcommittee.

Mr. Pocar (Italy): Since this is the first time I have spoken at this session of the Committee on the Peaceful Uses of Outer Space (COPUOS), let me express my delegation's satisfaction at seeing you, Sir, continuing to preside over our deliberations at this, our first regular session in Vienna. Your experience and wisdom in guiding the debates and the consultations among members are the best guarantee of success in the work of the Committee.

Commenting on agenda item 6, the Italian delegation endorses with interest the report of the Legal Subcommittee on the work of its thirty-third session. Although no decisive progress has been made on any of the issues under consideration, the debate that has taken place on each of them has been rich and concrete in many respects. No doubt such an approach was promoted by the flexibility introduced in the methods of work of the Subcommittee, which must also be recognized and underlined with satisfaction, as a useful means to rationalize and improve the efficiency of the Subcommittee's deliberations. We take this opportunity to hail the way the Chairman of the Subcommittee made use of that flexibility during the session.

However, and notwithstanding these positive developments, the Italian delegation still thinks that other steps should be taken as regards the time allocated to the Subcommittee and its agenda. The latter, in particular,

should in our view be rethought and reorganized in order to avoid items on which no progress has been made for a significant number of years preventing the Subcommittee from dealing with other issues discussion of which might prove more fruitful. In this connection, we view with interest suggestions that emerged during informal consultations and favour consideration of these proposals at the next session of the Subcommittee.

Turning briefly to the items discussed at the last session of the Legal Subcommittee, we have taken note of the current state of the debate on the subject of the delimitation of outer space and of the use of the geostationary orbit, and have followed with attention the statements made by other delegations. Although we are not as a matter of principle against exploring new or alternative approaches to the issues that are on the agenda of the Committee and its Subcommittees, we still do not think that any progress can be made in these areas. On the one hand, the subject of delimitation does not have at present, in our view, any standing in current international space law. As to the geostationary orbit, the problems that the Subcommittee might consider are already being dealt with by the International Telecommunication Union (ITU); we maintain the view that moves that could alter or undermine the efficient and well-balanced regulations established by the ITU should be avoided.

The Italian delegation has followed with attention and taken part in the discussions on the item concerning outer space benefits, and wishes to stress the role of cooperation between industrialized and developing countries in this respect. Italy itself is taking part in a wide range of activities with direct benefits for developing countries; these are being carried out in accordance with multilateral treaties and agreements, and within international space organizations. Although we maintain the doubts we have expressed on previous occasions as to the need at the present stage to draw up principles or guidelines besides those already existing in the basic treaties on outer space, consideration of the forms in which multilateral and bilateral cooperation is currently taking place would certainly be fruitful with a view to developing and promoting a general framework in the interest of all States.

Finally, let me refer briefly to a subject that has been touched upon by several delegations: the subject of space debris. My delegation was among those which from the beginning favoured seeing this issue considered by the Scientific and Technical Subcommittee, and we welcome the progress that was made there at its last session. However, we think that the problems that this subject raises should be further clarified at the scientific and technical level before taking them to the Legal Subcommittee for consideration. We also have taken note with appreciation of the efforts made by other bodies, such as the International Law Association, in this field; certainly, future consideration of the legal side of this urgent matter will benefit from the debates that have taken place or will take place in other forums.

Ms. Gonçalves Dias (Portugal): Our general view of the work of the Legal Subcommittee at its thirty-third session is a positive one. In spite of the fact that, as we all know, there are highly controversial items on its agenda that have been unresolved for years, the Legal Subcommittee has made considerable efforts to cope with other important items and with new developments of relevance to the international community.

One of these is the issue of outer space benefits. We understood from the discussions at the last session of the Subcommittee that the apparent disagreements on the document under discussion relate more to form than to substance. As stated in annex III of the report (A/AC.105/573), the intention behind the proposed set of principles is not to limit the freedom of States to choose their partners or modes of cooperation but, rather, to serve as guidelines for enhancing cooperation. If approved by consensus at a later stage, a set of principles of that kind could certainly improve the global atmosphere for cooperation in this field.

Some adjustments in the drafting of the working paper contained in document A/AC.105/C.2/L.182/Rev.1 might facilitate consensus, so we look forward to the revision of that paper which its sponsors are working on.

Looking ahead to the next session of the Subcommittee, we want to state that we can agree with the suggestion on holding a seminar, which might serve to inform the members of the Subcommittee on the results of legal studies on the issue of space debris. This would help clarify our ideas on this matter, and would, of course, not imply the necessity for any move to include this subject on the agenda of the Subcommittee.

The identical reasoning could be applied to the questionnaire on aerospace objects, which, in our view, should be the subject of detailed discussion during the next session.

In general, we consider it important that the Legal Subcommittee should, as far as possible, anticipate factual

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developments and factual problems and be kept regularly informed on the work of legal experts in the field of space law. The Subcommittee should, in our opinion, not only react to problems when they emerge, but anticipate them.

Mr. Louet (France) *(interpretation from French):* I had not initially intended to speak on this item of the agenda, since my views are very amply and well expressed in the report of the Legal Subcommittee before the Committee. However, I decided to speak in order to comment on the statement by the representative of Brazil. He raised a question which was abundantly dealt with in the Legal Subcommittee and which is reflected in paragraph 43 of annex II to the Subcommittee's report.

In his statement, the representative of Brazil - in a very significant fashion in my view - discussed two subjects: first, the status, working methods and programme of work of the Legal Subcommittee and, secondly, the possible convening of a seminar on space debris during the Subcommittee's session.

I think the fact that these two issues were broached together is in itself very interesting. The Brazilian representative said that for some delegations the efficient utilization of the resources of the Subcommittee had come to be synonymous with the reduction in the length of its session. I should like to point out that I do not at all agree with this. I am not asking for a reduction in the length of the sessions. Quite the contrary: I think it important that the Subcommittee should constantly adjust the length of its sessions according to the nature of the subjects submitted to it for discussion. However, I would not want the extension of the duration of the Subcommittee's session to be an objective either. I do not think that maintaining the duration should be considered as more important than the work done by the Subcommittee. I shall not be so cruel as to dwell on the real motives of those who would prolong the sessions of the Subcommittee, since that would not be to the glory either of the Subcommittee or of Headquarters.

The representative of Brazil advocated the convening of a seminar on the grounds that that would keep the members busy. I regret to say that I cannot accept such an argument. It is not a question of keeping people busy. I think that it serves no purpose to find work just to fill the time available. That is not the right approach.

The value of the seminar itself has also been adduced as an argument in favour of it. There again I absolutely do not agree. We had a long discussion on this and agreed that the Scientific and Technical Subcommittee would go into this matter in detail and would study it in depth before possibly considering a request to the Legal Subcommittee for its views. If we ask the Legal Subcommittee to take this matter up for consideration now, we are simply introducing confusion into an already difficult discussion.

I have said this in the Legal Subcommittee and I say it again here simply because this matter has received detailed consideration. But I do not believe that these points I have made are new.

Mr. Riobo (Chile) *(interpretation from Spanish):* My delegation took part with great interest in the informal consultations on the future programme of work, the organization of work, and the agenda of the Legal Subcommittee. My delegation believes there is a broad range of legal matters which have not been considered in the Subcommittee because it has - quite rightly - concentrated on major subjects of international public law with a view to resolving some difficult problems in an area which is new and being formulated. But we believe that in the current situation, particularly the greater traffic between countries in the field of space technology, the Legal Subcommittee should devote itself to the consideration of other agenda items and points of view. In this connection, we listened with great interest, for example, to the suggestions made here by the delegation of Germany.

My delegation also believes that the Legal Subcommittee should, during the organization of its work, take up the subject of coordination and communication with the Scientific and Technical Subcommittee. For example, the subject of space debris, which is dealt with specifically in the Scientific and Technical Subcommittee, could also be dealt with in a year or two by the Legal Subcommittee. It is not necessary for one Subcommittee to conclude the whole consideration of an agenda item before the other Subcommittee can take it up at least at the level of the principles involved. In that light, we believe it would be very constructive to consider the Brazilian proposal to hold a seminar on the subject of space debris to see what, in principle, could be the major topics for discussion in the Legal Subcommittee; this would be, of course, without prejudice to the work that might be proceeding in the Scientific and Technical Subcommittee on the technical aspects of that item.

Mr. Cassapoglou (Greece) *(interpretation from French):* For my part, I should like to congratulate you, Sir, on your efforts to resolve this very thorny problem of the enlargement of the Committee. We have really

appreciated what you have done, and we hope the eventual solution will be the most advisable one.

I should like to comment briefly on the work of the Legal Subcommittee, and especially on the role it has played since 1968. For almost 30 years now the Subcommittee has been engaged in very good and constructive work. We, as legal experts, are very aware of this and we realize that regulations never stand in the way of technological progress. Quite the contrary: activities taking place in a legal context which is dependable and predictable facilitate work in complex spheres such as outer space, with particular reference to its use for peaceful purposes.

As concerns the question of the delimitation of outer space and in particular all the problems raised with regard to the use of the so-called geostationary orbit, we agree with our colleagues that this cannot be given separate status as compared to the status of outer space in general.

For instance, one cannot compare - depending on the type of vehicle one uses, of course - traffic on a highway with traffic on a small road, or the situation of a person who lives near a highway with that of one who does not. As members know, Greece did a considerable amount of work on formulating article 33 of the Nairobi Convention. We believe that the method used to deal with this problem is very satisfactory and that it should continue to be used. The only thing that we can do here is to facilitate other types of use which are not determined by the role of ITU.

Once again, Mr. Chairman, I should like to ask you to accept our hearty thanks for your role.

Mr. Telles Ribeiro (Brazil): I should like to thank you, Mr. Chairman, and, through you, the Committee, for allowing me to abandon for a few minutes my role as Rapporteur and to take up my role as head of the Brazilian delegation.

I think that this is a good occasion to react in a constructive way to the comments that the representative of France has just made with regard to the suggestion we formulated in the Legal Subcommittee about the possibility of holding a seminar on space debris in that Subcommittee.

As all our colleagues know, we did make that suggestion. In fact, it was supported by many delegations present here - if I recall correctly, by Canada, Russia, India, Argentina, Colombia and Chile - and I think I am omitting at least three or four others. Also, Portugal was added to this number just a few minutes ago. I think that the delegations which supported us on that occasion and support us now have no fear that there would be duplication between the two Subcommittees. Quite the contrary: all the delegations know that it is of the utmost importance that this matter be seriously considered in the Scientific and Technical Subcommittee. Otherwise, it would be quite impossible for the Legal Subcommittee to legislate on this matter in the future, if the occasion arose and if the technical and scientific conclusions advised us to do so.

I believe, therefore, that the objective of the delegations that supported us is the same as our own - to have a complementary avenue - because, to our minds, knowledge is not a source of fear. We think, on the contrary, that knowledge is one of our obligations. In fact, we are sometimes even slightly suspicious of some of the reactions we have had in this respect. Once the duplication problem is taken care of as we have indicated, we believe that we could only gain from such a seminar.

But I want to clarify something else: We never suggested that the seminar would take place simply to occupy us - although it might be a very good idea. But what we had in mind was to start a debate - one that actually exploded, as it were, last Friday in the informal consultations. What we saw here last Friday was - and you said so yourself, Mr. Chairman - a rather unique moment. We saw delegations voicing differences but converging around one important theme: the urgency of giving substance to this Subcommittee, which we all consider very valuable for the future of the Committee itself. What we saw Friday and what we hope to see at the next session of the Legal Subcommittee is an effort to add ideas to our work, and it was to this end that we proposed that the seminar take place - not just to kill time. I say this with great respect for the opinions of our French colleague, with whom I share a personal friendship, apart from our work here.

The Chairman: We have concluded our consideration of agenda item 6.

Agenda item 8

Spin-off benefits of space technology: review of current status

Mr. Utkin (Russian Federation) *(interpretation from Russian):* In the context of the detailed discussions on agenda item 8, our delegation would like to address the complex and mutually related important problems of conversion, the dual use of space technology resources, the

transfer and utilization of the achievements of new technologies, and space exploration in the economic sphere.

The process of conversion consists of a complex set of political, military, economic and social problems, whose solution requires a comprehensive approach. It is not just a "campaign" with periodic weakenings of international tension but in fact is an ongoing, constant component of the economic policy of countries whose defence industries take up a major part of their gross national product.

It is a secret to no one that space exploration serves as a significant catalyst for technical and social progress. In the future, this will become even more true. At the very apex of progress, a major place is occupied by space exploration and also possibly by nuclear energy, which, because of the great requirements placed on production in that area, give rise to rapid development in new areas of science. They also put huge demands on a whole set of industrial sectors - the machinery construction industry, radio electronics, transport, information and computer technology - and at the same time they stimulate rapid development in those spheres.

As the chief designer of military strategic rockets of the SS-18 and SS-24 type, of the ZENIT and CYCLON launch vehicles, of spacecraft of the Okean and INTERCOSMOS series and of others, built earlier in the Soviet Union, and now as the director of Russia's main scientific and technical research institute on space technology, I find these questions particularly important and close to my heart.

Work on conversion and on the development of new technologies in rocket and space technology and their application in various areas of the economy of the States has already led to tangible, practical results; in the future it should deal also with expenditure on space programmes.

Allow me to use the example of Russia and briefly describe some of the questions we have addressed. Producing direct and spin-off benefits through conversion and the transfer and use of space technology in industrial sectors in Russia is one of the major thrusts of our national activity, which we are undertaking in the context of the federal space programme to the year 2000. The achievements in the space field are being applied in three main areas.

The first is the direct use of space resources for economic purposes and work on the conversion of defence space resources to the solution of economic, scientific and commercial problems by partial modifications of defence space systems. Currently, the main developers of space resources have prepared over 75 conversion projects, including 20 that require no alteration, related to redistributing the functions of space systems so that they can be used for specific civilian purposes.

We are very pleased to state that the main scientific research institute on space technology in Russia, with the active participation of the main design organizations in Russia and Ukraine - this has already been referred to by the representative of Ukraine - are carrying out multi-level work, among other things on the basis of military rocket technology. For example, there are proposals to use military rockets, with minimal changes, for the implementation of peaceful tasks, the prevention of natural disasters and the timely delivery of cargoes of assistance for areas that have suffered disasters. Navigational, geodesic, radiotelephone, television and other forms of information received from dual-use satellites - military and civilian - are widely benefiting various Russian and foreign users. Members are well aware of examples of international systems set up on that basis: GLONASS, NAVSTAR and KOSPAS-SARSAT. It is now possible for any State and any user in Russia to receive timely high-resolution images recorded by military means.

While implementing this cooperation, we are involved in comprehensive inter-State experimental work on the "Oriel" - "Eagle" - theme, which seeks rational ways to apply and assess the effectiveness and economic benefits of aviation and space systems and multiple-use rocket systems. On other complex scientific and research subjects, we are defining the prospects for space exploration, working on remote-sensing of the Earth by satellite and determining the characteristics and composition of a future system of environmental monitoring. In the interests of economic development, we are studying ways of creating a new generation of dual-use systems. One of the main areas of the institute's research is study of the problem of space debris and ways of dealing with it. On all these subjects, we are prepared to engage in broad international cooperation.

The second area is the transfer of what I would call advanced space technology to other spheres. We all know that most new technologies, developed and mastered in the production of space technology, can be used by both civilian and military consumers. For example, only 20 technologies have a specific use that can be demonstrated. This means that space technologies can be applied with even greater success in the production of economically

useful products. A major area of interest, for example, is that of technologies developed on the basis of scientific research, including special types of welding, electronic-ray welding, laser welding and so on.

Technologies developed for space rockets, including corrosion-resistant steels and welds, inflammable fibers, composite powder-based ceramic, and other new materials, as well the technologies for producing them, are now being widely applied in various areas of the economy. Thus, for example, at this time space technology is providing new advanced finishing, insulating and anti-friction materials for the housing industry and, in the field of energy, is providing catalysts for the scrubbing of smokes and gases at thermo-electric power stations. Products of carbon and carbon-based composite materials are much stronger than traditional graphites.

The third area is activation of the country's participation in the international commercial market for technologies, which is developing strongly at this time. For example, on the basis of an agreement between Russia and the United States, we intend to carry out commercial launches of the Proton launch vehicle at a time when there is great competition in the launching of such vehicles.

Space technology is becoming a product in itself and must satisfy the requirements of the world market. One area of particular interest in this respect is technology for the production of special surfaces, for the strengthening of instruments, for plasma fusion of bimetallic products and for containers for the storage of aggressive materials. Stationary plasma motors are being experimented on in the United States. We are emerging into the world market on the strength of work in a number of fields.

Currently, in Russia and the countries of the Commonwealth of Independent States, a strengthened mechanism for the transfer of the achievements of space technology is being developed; the necessary scientific and technical policy is being drafted simultaneously. Currently, the idea of increasing the competitiveness of our products and services through the use of space technology is being increasingly supported by state and commercial structures. The development of new space technology for production in microgravity conditions, with qualitatively new semiconductors and optical materials and biological and medical substances are opening up real prospects for practical benefits.

We clearly understand that global problems facing the world community sometimes cannot be solved by one State alone, however developed it may be or whatever the strength of its economy. Major problems can be effectively and rationally solved only by means of broad international cooperation. That having been said, the implementation of major projects obviously requires a quest for new types of solutions as well as the planning and creation of space systems. At the same time, a rational and effective mechanism must be worked out for the distribution and exchange of new technologies among countries without discrimination. Russia is ready to move along those lines towards the broadest possible mutually beneficial cooperation with all States concerned.

Without claiming to have shed light on all the problems facing mankind in the development of practical benefits, we trust that we have indicated the great possibilities and potential of a clearly defined and effective use of the achievements of space science and technology in the interest of the social and economic development of all States.

Mr. Zaman (Pakistan): I have only a small suggestion to make on agenda item 8, "Spin-off benefits of space technology".

The Committee on the Peaceful Uses of Outer Space recommended during its last session that the United Nations Programme on Space Applications consider including in at least one of the training courses, seminars or experts meetings each year the subject of promotion of spin-off benefits from space. This should do much to educate the educators and the public alike about the immense utility of these spin-offs.

After hearing the very elaborate and exciting statement just made by the representative of the Russian Federation, I feel that there is now a need to consider setting up a coordinating body to serve as a centre for collecting information pertaining to spin-offs and disseminating it to the international scientific and industrial community in order to enlarge the scope of their use of spin-offs in the wider humanitarian interest.

Mr. Hu Zhongmin (China) (*interpretation from Chinese*): I should like to offer some information on certain Chinese achievements in the area of the spin-off benefits of aerospace technology.

As everyone knows, since the introduction of the first artificial earth satellite, the rising number of space activities and the development of space technologies have played an ever greater, and indeed unique and irreplaceable, role in

seeking the progress of society and civilization for the benefit of mankind.

In the mid-1950s, China began to implement its key programme for the development of space technology. Thirty years of arduous effort have made it possible for China to improve its capacities and level of space technology greatly.

Full research and production structures, including associated areas, have been developed. As a result, we are now in a position to undertake scientific experiments, technical trials and remote sensing for the re-entry of satellites, as well as to design and produce all types of artificial satellites, including those for telecommunications and meteorology. We not only have the launchers of the types Long March (LM) I, II, III, III-A and IV, as well as the large launcher LM II-E, with side-by-side boosters, but have also mastered related key technologies that make it possible to launch satellites into any orbit, and to relocate, control and recover them. In China, 36 successful launches have taken place since 1970, which has made it possible to place 41 scientific and technical satellites in orbit for practical applications.

All this has also enabled us to gather a staff of engineers and researchers who are very sophisticated, dedicated and competent.

Space technology, as an engineering system of great significance for mankind, covers practically all areas of the natural sciences and employs the most recent achievements of modern science and technology. It leads to the development of a whole range of advanced technologies and gives an impetus to the technological transformation of traditional industries as well as to technological progress, thus playing an increasingly important role in the development of society and the progress of mankind.

The Chinese Government attaches great importance to the development and use of aerospace technologies, but it also scrutinizes very carefully the ways in which such technology is re-exploited and reused.

Converting these technologies for use in other sectors of the national economy is a very important facet of the application of aerospace technologies. Chinese aerospace industries have in the past few years achieved very positive results in this field.

Since the 1980s the Chinese aerospace sector has ceaselessly pursued strategies aimed at converting military production into civilian production. As a result, thousands of types of equipment necessary for the various sectors of the national economy as well as durable and useful consumer goods have been developed. Among space technologies that have thus been applied to other uses, 20 per cent are the result of technological re-exploitation.

Some aerospace technologies, for example satellite temperature control techniques, low temperature controls, remote sensing, special machine techniques, and repeated tests, have been converted for use in other basic industries, thereby playing an important role in improving the work environment, conserving energy and increasing productivity.

I would like to offer some concrete examples here to illustrate what I have just said.

Chinese aerospace sectors have developed, on the basis of satellite temperature control techniques, a low-temperature thermal pipe exchanger. By adding this exchanger to a thread-preparing machine and using the recovered residual heat, it is possible to save annually per machine energy equivalent to 66.5 tons of standard coal; moreover, the working speed is increased by 33 per cent. This technique is now also used in ceramic ovens, glassmaking and industrial boilers.

In the field of materials for the production of energy, we have developed a new type of battery, a zinc-air battery, developed on the basis of the fuel battery H2-O2, used in space navigation, and the high-powered zinc dioxide battery, used in military vehicles. This battery is exceptional for its high massive energy flow - 880 watts per kilogram, low cost, excellent performance at low temperatures and stable voltage. Thus it has a very wide range of possible uses in beacons, telecommunications, lighting, seismography, and so forth.

In the field of human intervention in weather forecasting, meteorology, fire-fighting and petroleum detection here too encouraging results have been achieved by using techniques employed in solid fuel rockets to manufacture rockets to increase rainfall and prevent hail, anti-lightning and anti-fog rockets, lightning-rod rockets, lightning-deflector rockets, fire-fighting rockets, petroleum-extraction rockets using high pressure gas techniques, and solid propulsion agents for the thermal extraction of thick petroleum.

In the field of automated control techniques, sensitizers whose use was previously limited to regulating

satellite positioning have made it possible to develop the first photo-electric diameter measurement system for hot rolling, which, in turn, has improved working conditions, increased productivity and allowed for greater compliance with products standards. This system, used in the Xinhu steel-works in Shanghai, has made it possible to save 600 tons of steel per year.

There have also been very positive spin-offs from the transposition of aerospace informatics technologies and radio-electric equipment, in the fields of networking techniques, system centralization, artificial intelligence, and so forth. We have recently developed command systems for the assembly and dispersion of industrial processes, industrial PC-computer control systems, programmable control systems, "smart" process command systems, automation of common transport systems, and so on. These systems are widely used for, among other things, automatic dose control of materials for the production of cement, chemical treatment of water in thermal stations, automatic surveillance of the atmospheric environment, security and quality control systems, electrical network command systems, and control centralization in air traffic control towers.

The Chinese aerospace industries are also trying to apply advanced aerospace technologies to general as well as specific engineering projects. In this respect, major work has been undertaken on simulation laboratories, on the recently erected giant Buddha in Hong Kong, on the manufacture of double-walled spheric reservoirs without moulding, and so forth. All these projects use advanced techniques from the transposition of technology, in such fields as soundproofing, electro-magnetic screening, surfacing, improved anti-seismic resistance, air conditioning, prevention of combustion, cleaning, hothouse temperature control, environmental protection, and so on.

What I have just described certainly does not cover all of the achievements in Chinese aerospace work - indeed there are an ever-growing number of such achievements. I can assure the members of the Committee we shall be reporting next year on other, newer, applications of these technologies.

The re-exploitation and the reuse of aerospace technologies certainly opens vast prospects for us. That is why the Chinese Government actively supports the sectors involved in this effort. Our aim is the application of aerospace technologies to civilian industries at a higher level of quantity and quality, and more rapidly.

The Chinese space-technology industry sincerely wishes to develop exchanges with its foreign counterparts, to contribute jointly with them to the peaceful use of outer space for the benefit of mankind.

I wish to inform the Committee that I have with me documentation which describes not only the positive spin-off of aerospace technologies but also the Chinese aerospace services - namely, the National Aerospace Administration, the Chinese Aerospace Society and related services. I would ask members who are interested in this documentation to contact the secretariat.

Mr. Hodgkins (United States of America): Many new and improved products and processes have continued to result from new technologies developed by the United States space programme in pursuit of its mission objectives. A number of the uses of NASA-developed space technologies released during 1993 have aided in new applications and uses on Earth. New advanced technologies in materials research, robotics and telecommunications, life sciences and many other fields, are continuing to find alternative uses in many areas of human and economic concern.

In the field of health and medicine - one of the most promising areas in which space-related technologies have been transferred and applied - advanced cooling systems developed by NASA for astronaut use have helped alleviate the heat-stress symptoms of those afflicted with multiple sclerosis (MS). Multiple sclerosis is a progressively disabling disease of the central nervous system that strikes men and women in the prime of life. Body cooling of even one degree Fahrenheit can produce dramatic improvements in MS symptoms. The Multiple Sclerosis Association of America (MSAA) has now adopted space-suit cooling technology in a treatment campaign to help more than 300,000 MS patients in America.

The NASA Lewis Research Center has recently developed an ion exchange membrane for advanced space batteries. The membrane filter, surprisingly, has an affinity to absorption of heavy metal ions prevalent in industrial wastewater systems. During 1993 NASA worked on an experimental industrial filtration method with industrial electroplaters to develop large-scale systems that would yield clean water from heavy metal industrial production facilities. If successful, application of the ion exchange membranes to mining operations to filter heavy metal residues will be undertaken.

Public safety has also been an area that has benefited from space-developed technology. In one example, quality assurance inspectors of industrially produced products are using low-level X-ray machines that have incorporated X-ray astronomy research conducted by NASA. Low-level X-radiation in these devices is less than 5 per cent of that of standard X-ray systems, thus protecting operators of such systems on assembly lines. In fact, the radiation levels are so negligible that the United States Government no longer requires operators to use lead aprons, film badges or protective barriers.

Those and other examples of aerospace spin-offs are the product of deliberate and aggressive interaction between NASA and industrial and commercial concerns. Such efforts take place through the active dissemination of information, personal contacts between NASA scientists and engineers and users of technology, and even partnerships that have been forged between NASA and industry.

At this point I should like to indicate to the Committee that we have several documents at the back of the Conference Room for consideration by members. The first document has nothing to do directly with spin-offs and I failed to mention it in my opening statement. It is entitled "One Giant Leap for Mankind", a commemorative publication on the twenty-fifth anniversary of the moon landing. We have the most recent spin-offs publication for 1993 that NASA has produced and then we have a 30-year commemorative edition of NASA spin-offs.

The United States is firmly committed to meeting the challenges of space exploration as we approach the twenty-first century. We also feel confident that our efforts to continually seek to transfer and exploit useful technologies here on Earth will contribute to yielding significant future dividends such as these for the benefit of all mankind.

As a tangible expression of that commitment, it is my pleasure to inform the Committee that the United States Department of State has recently approved a grant of $30,000 to the United Nations Programme on Space Applications. This grant will support a workshop for developing-country experts on adapting space technologies to promote sustained development. We are planning to hold the workshop within the next year, and look forward to reporting on the results of that important meeting.

Mr. Webb (Canada): The Canadian Government has been working for many years to ensure that the Canadian space programme results in concrete benefits to Canadians, in the short, medium and long term alike. Our space programme has often led and continues to lead to the introduction and development of new technologies, products and services with concrete applications on Earth in the space and non-space sectors. I would like to take a few moments to describe a few of the tangible past or expected spin-off benefits resulting from the Canadian space programme.

First, the expertise acquired in the development of the mobile servicing system for the International Space Station has led to the identification of over 60 technologies with proven or anticipated market potential for terrestrial applications. Among the possible utilizations of these robotic techniques are robotic technologies for underwater research, forestry and mining applications, as well as energy-management systems and the cleanup of nuclear-contaminated sites. In the field of life sciences, Canadian and international research continues to point to a future of enhanced knowledge about the human body as well as new or improved diagnostic techniques and pharmaceutical products for the treatment of diseases on Earth. For example, a Canadian company based in Montreal has now used space technologies in the development of an artificial heart and has signed an agreement with a medical research institution for that purpose.

Mr. Forna (Romania), Vice-Chairman, took the Chair.

In the field of Earth sciences, investments in satellite scientific and remote sensing instruments and systems continue to yield essential data for important applications in geography, geology, the study of ice oceans and icebergs, and disaster warning, prevention and relief. These investments have also led to significant progress in the management of our natural resources and the protection of the environment. This is expected to continue with the launch in early 1995 of the Canadian Radarsat Earth-observation satellite, able to see through clouds and under the cover of darkness.

There is one additional spin-off benefit that needs to be mentioned. The Canadian experience has been that investment in space education and awareness activities harnesses the unique appeal of space for Canadian youth and thus helps promote careers in science and technology, contributing to the long-term skills necessary for a knowledge-based economy.

Canada strongly believes that the benefits I have highlighted and many others can best be realized and shared through international cooperation. This explains why such an important part of the Canadian space programme is

premised on collaborative efforts with many nations and organizations. We welcome any productive ideas for enhanced cooperation in all fields of space activities.

Mr. Chandrasekhar (India): Our delegation would like to make a few remarks on the recent progress in India in promoting and realizing spin-off benefits of space activities. From the beginning, the Indian space programme has attached importance to the dissemination of knowledge and skills gained in the development of space technology and its applications for the broader benefit of society. As an act of policy, the Indian space programme has been pursuing the transfer of technology on promotional terms to encourage various spin-off uses. A scheme that was instituted by the Indian Space Research Organization more than a decade ago resulted in the transfer of 216 technologies, which served to expand space application markets in fields such as telecommunications, meteorology and natural-resources management, and also in a significant number of spin-off uses.

The Indian space programme has also executed over 100 consultancy projects for the benefit of industries, to assist in their diversification and product-development efforts. All in all, some 500 industries, ranging from small to large in size, have benefited from their partnership with the space programme. During the fiscal year 1993 to 1994, technologies for 12 new products and processes have been transferred to Indian industries. These include items such as temperature sensors, telemetry systems, optical solar reflectors and low-cost image analysis equipment.

The last year has also seen a growing demand for some of the spin-off products earlier commercialized in industry, thus providing scope for additional licensing to new industries. Examples of such products include a multilingual word processor, a process for producing precipitated silica from waste items such as the ashes of rice husks, and a cleaning chemical used by industrial labour.

Given the multidisciplinary nature of space activities and the broad range of space activities in India, the technology transfers from the space programme to industries have recorded a steady growth and achieved a high success rate. There is no doubt that a sound approach to design and a rigorous quality-assurance culture for the space effort are responsible for this. Several measures to widely promote spin-offs from space have been adopted by the space agency in India. These include dissemination of information on potential products and technologies, the conduct of market surveys, arrangements for conferences, meetings and demonstrations to potential recipient industries, and a promotional pricing policy for technology transfers. Competition is encouraged both in the selection of recipient industries and in the marketing of products.

In the recent past, the Indian Government has also promoted a commercial company called the Antrix Corporation to undertake commercial activities related to products and services from the Indian Space Research Organization. Through this company, the Indian Space Research Organization will be pleased to consider and extend know-how transfer and other services relating to spin-off products to interested users and organizations in other countries.

The meeting rose at 11.30 a.m.